TIDAL CURRENT CHARTS

SAN FRANCISCO BAY

U. S. DEPARTMENT OF COMMERCE
DANIEL C. ROPER, Secretary
COAST AND GEODETIC SURVEY
LEO OTIS COLBERT, Director

SERIAL No. 484

TIDAL CURRENT CHARTS, SAN FRANCISCO BAY

THIRD EDITION

These current charts show the direction and velocity of the tidal current for each hour of the current at San Francisco Bay entrance (Golden Gate). They present a comprehensive view of the tidal current movement for the bay as a whole and also supply a means of readily determining the direction and velocity of the current at various localities throughout the bay.

The charts, which may be used for any year, are referred to the times of "Maximum flood" and "Maximum ebb" at San Francisco Bay entrance (Golden Gate), daily predictions for which are included in the Pacific Coast Current Tables published annually by the United States Coast and Geodetic Survey.

The directions of the current are indicated by red arrows, and the velocities by red figures. The velocities, which are expressed in knots, are for the time of tropic currents, that is, the greater flood and ebb currents at time of the moon's maximum declination.

Nontidal currents.—These charts depict the flow of the tidal currents under normal weather conditions. Strong winds and freshets, however, bring about nontidal currents which may modify considerably the velocities and directions shown on the charts.

Use of charts.—Twelve charts are given, six being referred to "Maximum flood" and six to "Maximum ebb." The chart to be used for any specific time is determined by obtaining the difference between the given time and the time of the nearest "Maximum flood" or "Maximum ebb" for the Golden Gate as given in the Pacific Coast Current Tables. The chart with the legend that agrees most nearly with this difference is the one to be used for the specific time desired.

Having selected the proper chart, the direction and the tropic velocity of the current throughout the bay are readily obtained by the red arrows and figures on that chart.

The tidal current varies from day to day principally in accordance with the phase, parallax, and declination of the moon; and to obtain the velocity for the particular day and hour the velocities indicated on the charts should be modified as follows: Obtain from the current tables the predicted velocity of the "Maximum flood" or "Maximum ebb" current to which the chart is referred. With this predicted velocity enter the following table and obtain the corresponding correction factor. The velocities of the current for the particular day and hour are then determined by multiplying the velocities indicated on the chart by this factor.

Factors for correcting velocities

Maximum flood		Maximum ebb	
Predicted velocity (knots)	Factor to apply to velocities on charts	Predicted velocity (knots)	Factor to apply to velocities on charts
0.5–0.8, multiply by	0. 2	0.7–1.1, multiply by	0. 2
0.9–1.1, multiply by	0. 3	1.2–1.5, multiply by	0. 3
1.2–1.4, multiply by	0. 4	1.6–2.0, multiply by	0. 4
1.5–1.8, multiply by	0. 5	2.1–2.4, multiply by	0. 5
1.9–2.1, multiply by	0. 6	2.5–2.9, multiply by	0. 6
2.2–2.4, multiply by	0. 7	3.0–3.3, multiply by	0. 7
2.5–2.8, multiply by	0. 8	3.4–3.8, multiply by	0. 8
2.9–3.1, multiply by	0. 9	3.9–4.2, multiply by	0. 9
3.2–3.4, multiply by	1. 0	4.3–4.7, multiply by	1. 0
3.5–3.7, multiply by	1. 1	4.8–5.1, multiply by	1. 1
3.8–4.1, multiply by	1. 2	5.2–5.6, multiply by	1. 2
4.2–4.4, multiply by	1. 3	5.7–6.0, multiply by	1. 3
4.5–4.7, multiply by	1. 4	6.1–6.5, multiply by	1. 4
4.8–5.1, multiply by	1. 5	6.6–6.9, multiply by	1. 5

Owing to the complexity of the current in San Francisco Bay an involved set of correction factors would be required to give precise results for all conditions of the current. The results derived from the foregoing table, however, should serve for all practical purposes.

Example.—Suppose that the direction and velocity of the current in the channel off Point San Pablo is desired for 4 p. m. on a day when the predictions for San Francisco Bay entrance (Golden Gate), as given in the Pacific Coast Current Tables, are as follows:

Slack; flood begins	Maximum flood		Slack; ebb begins	Maximum ebb	
Time	Time	Velocity	Time	Time	Velocity
h. m.	*h. m.*	*knots*	*h. m.*	*h. m.*	*knots*
2 30 a. m.	5 38 a. m.	2. 8	8 44 a. m.	10 56 a. m.	1. 7
2 12 p. m.	5 21 p. m.	2. 7	8 21 p. m.	11 31 p. m.	3. 7

The desired time of 4 p. m. is $1^h\ 21^m$ before the "Maximum flood" at 5:21 p. m., this being the nearest maximum strength of current. The data desired will therefore be found on the chart designated "ONE HOUR BEFORE MAXIMUM FLOOD AT GOLDEN GATE." This chart indicates that the current at Point San Pablo is flooding (setting northward). The number (1.2) opposite Point San Pablo is the tropic velocity of the current in knots. To determine the velocity of the current for this particular day and hour, this tropic velocity is modified by a factor given in the table, "Factors for correcting velocities." From the current tables the velocity of the current at 5:21 p. m. (time of maximum current used as reference) is found to be 2.7 knots. For a predicted maximum flood velocity of 2.7 knots the table gives a factor of 0.8 to be applied to the velocities on the chart. The approximate velocity of the current is then found to be $1.2 \times 0.8 = 1.0$ knot.

As the time 4 p. m. is somewhat more than one hour before the nearest maximum current, which occurs at 5:21 p. m., more precise results may be obtained by interpolating between the data given on the two charts designated "TWO HOURS BEFORE MAXIMUM FLOOD AT GOLDEN GATE" and "ONE HOUR BEFORE MAXIMUM FLOOD AT GOLDEN GATE." The chart for two hours before maximum flood shows the current off Point San Pablo to be slack, while the chart for one hour before maximum flood gave the current as flooding with a corrected velocity of 1.0 knot. Interpolating between these data, the current in the channel off Point San Pablo at 4 p. m. on the given date is found to be flooding with a velocity of about 0.7 knot.

These tidal current charts were prepared by L. P. Disney, chief, section of tide predictions, under the direction of P. C. Whitney, chief, division of tides and currents.

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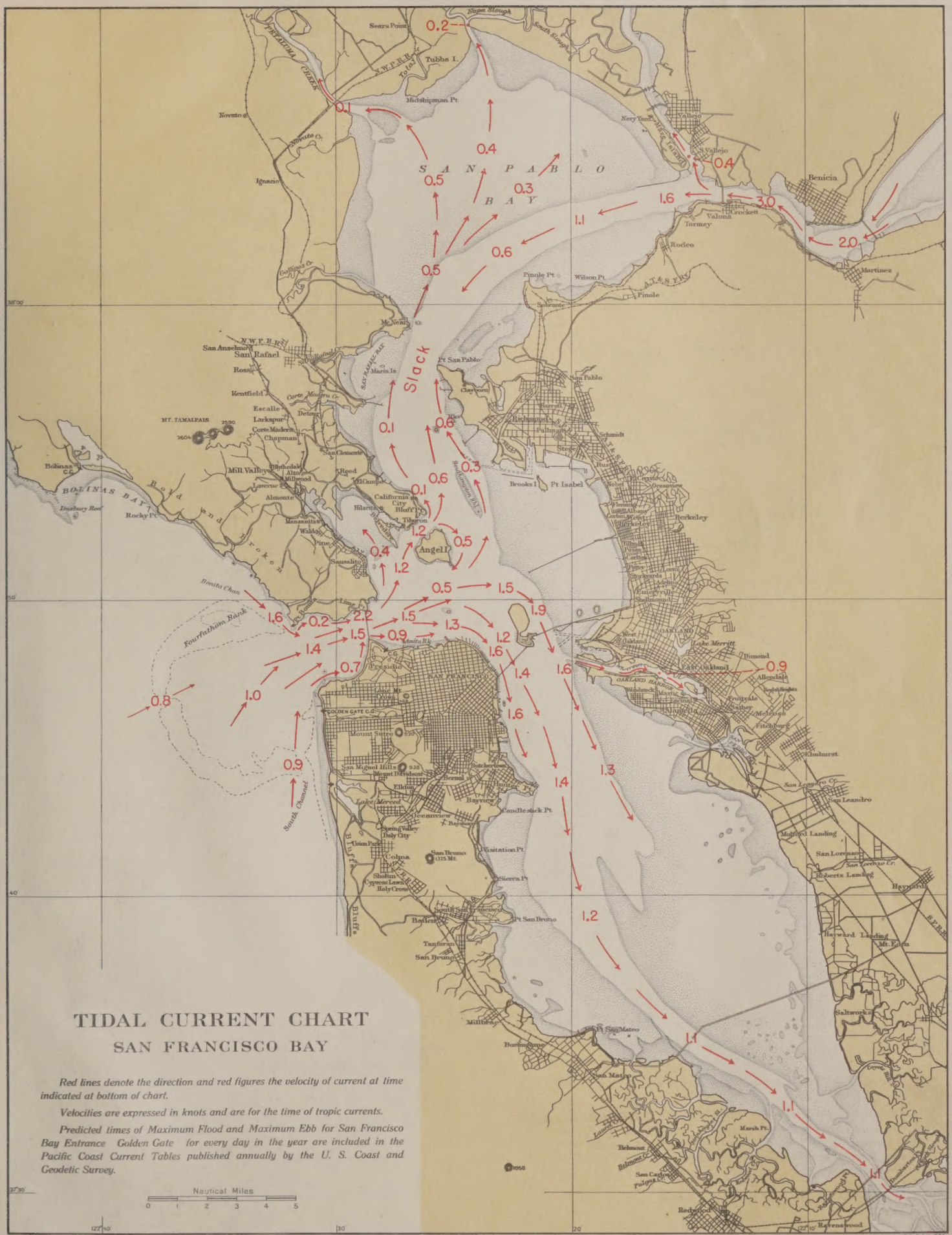

TIDAL CURRENT CHART

SAN FRANCISCO BAY

Red lines denote the direction and red figures the velocity of current at time indicated at bottom of chart.

Velocities are expressed in knots and are for the time of tropic currents.

Predicted times of Maximum Flood and Maximum Ebb for San Francisco Bay Entrance Golden Gate for every day in the year are included in the Pacific Coast Current Tables published annually by the U. S. Coast and Geodetic Survey.

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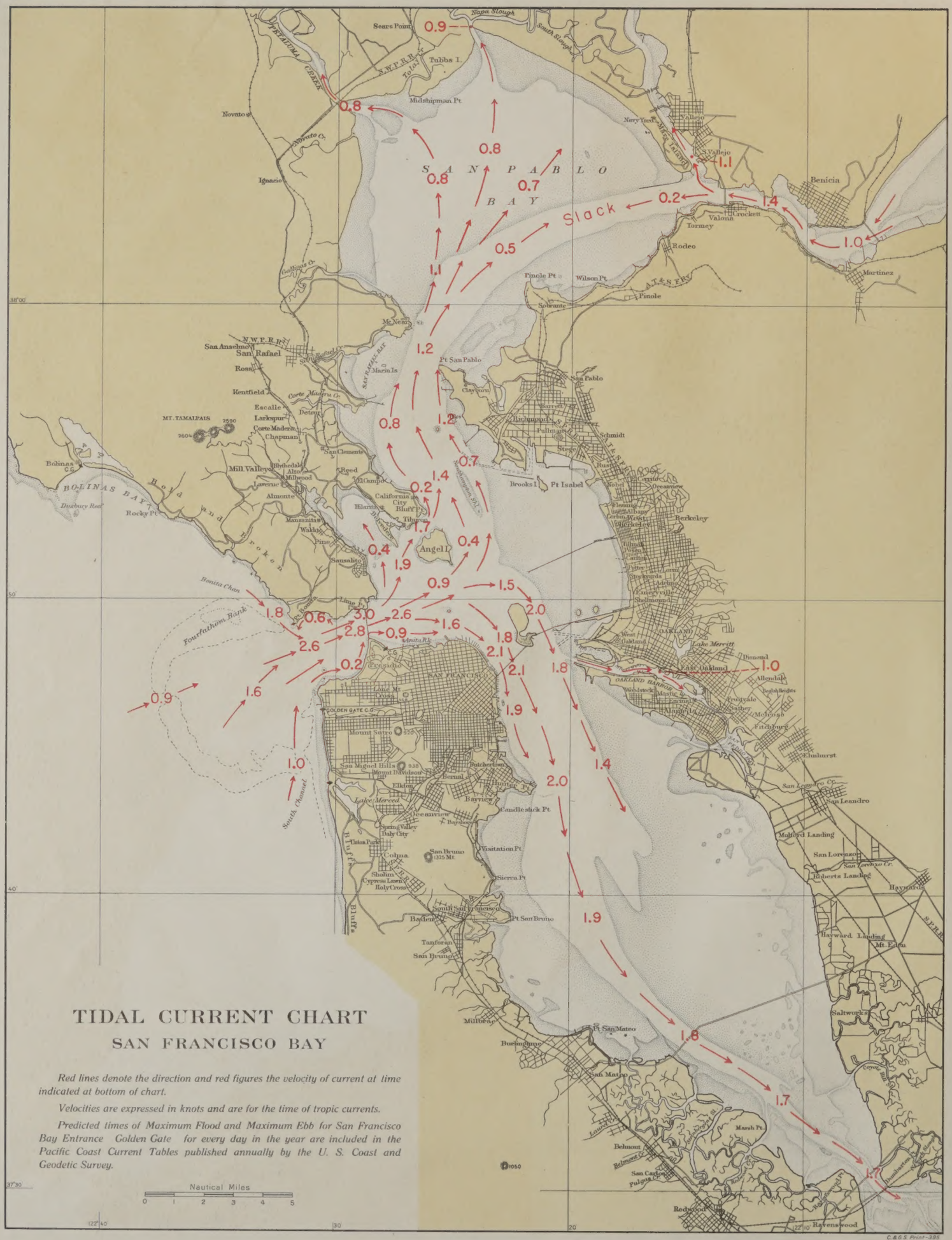
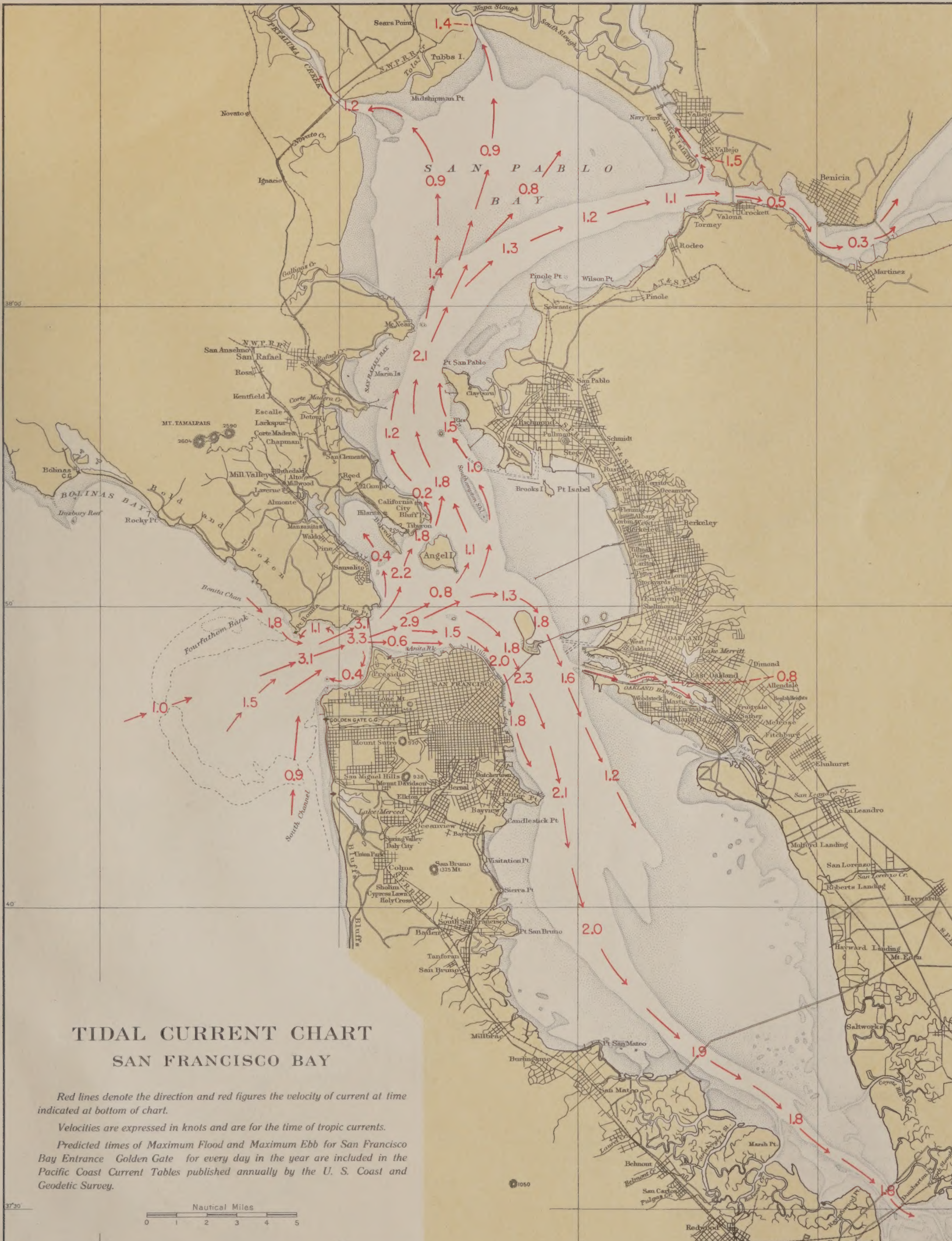
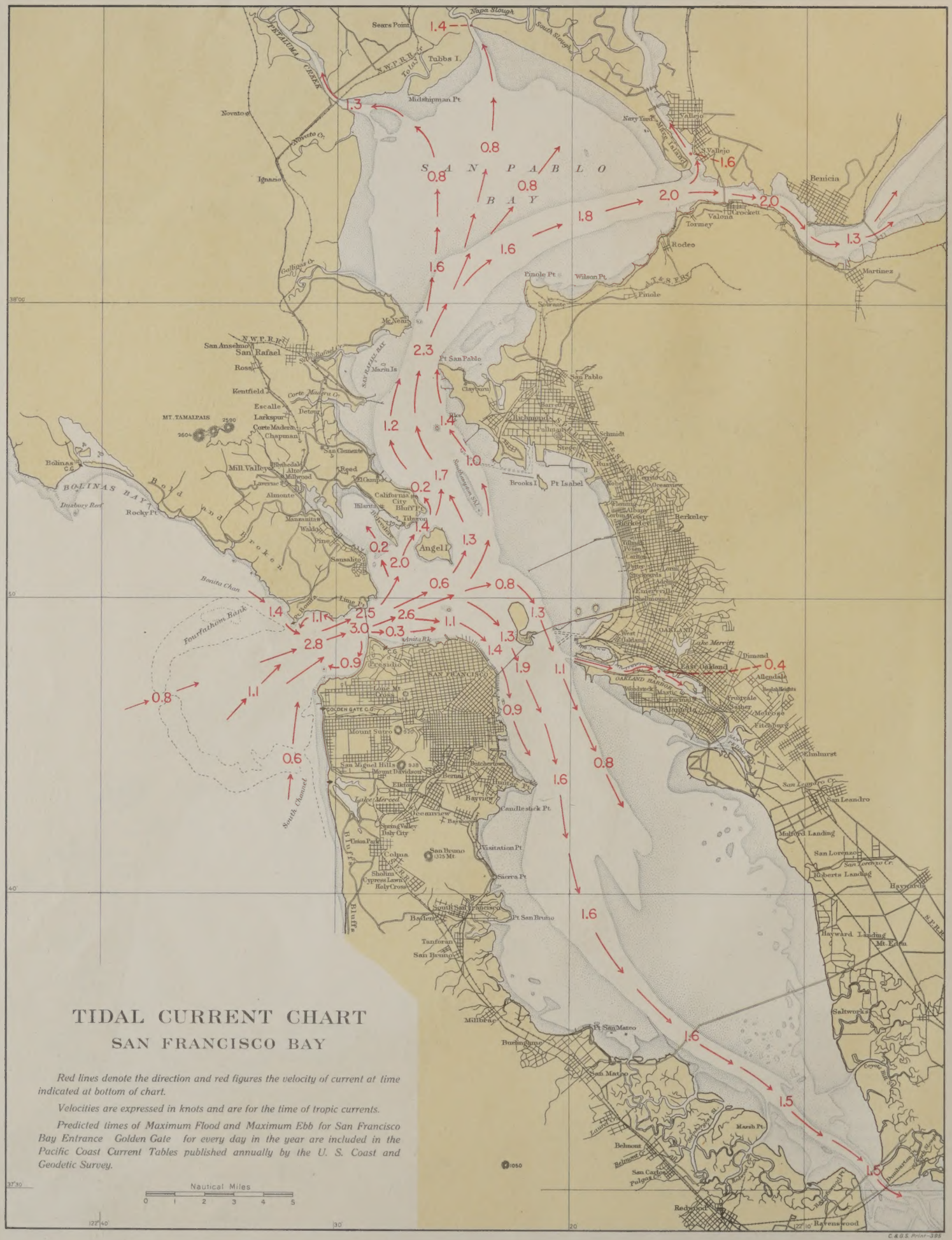
TWO HOURS BEFORE MAXIMUM FLOOD AT GOLDEN GATE



ONE HOUR BEFORE MAXIMUM FLOOD AT GOLDEN GATE



MAXIMUM FLOOD AT GOLDEN GATE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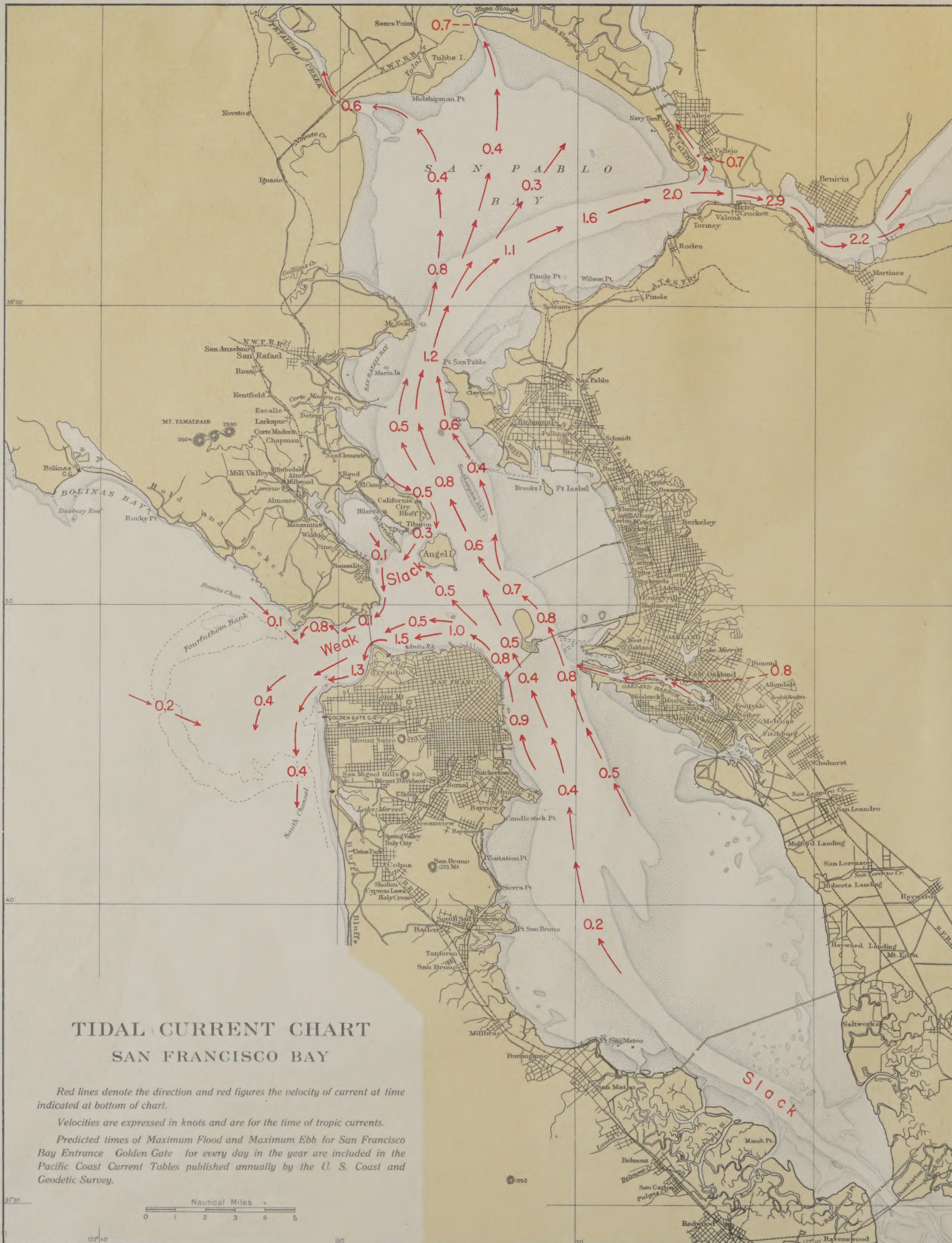
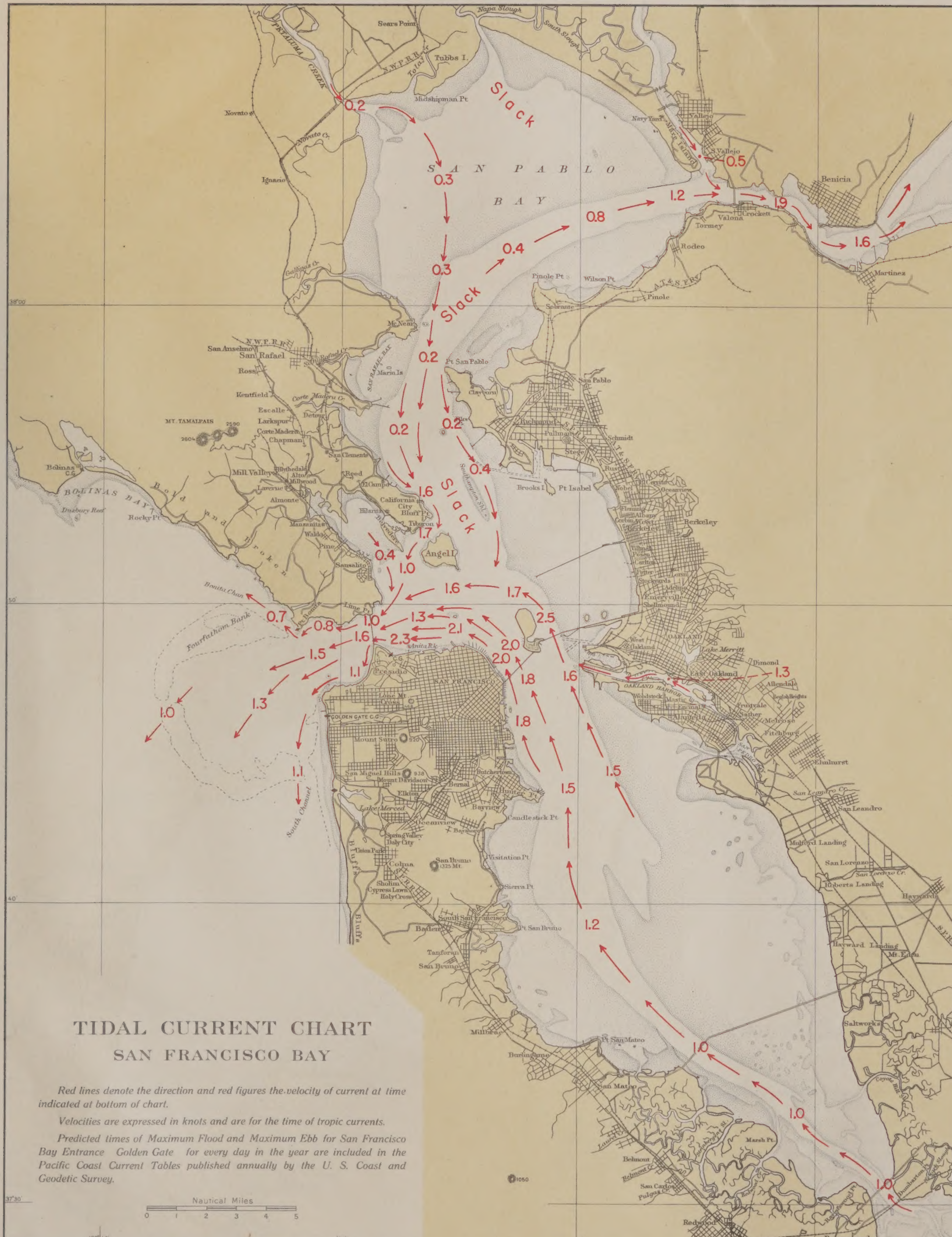
Nautical Miles
0 1 2 3 4 5
SAN PABLO BAY
1.4
1.3
0.8
0.8
0.8
1.8
2.0
2.0
1.6
1.3
1.6
1.6
2.3
1.2
1.4
1.0
1.7
0.2
1.4
0.2
2.0
1.3
0.6
0.8
1.4
1.1
2.5
2.6
1.1
3.0
0.3
1.3
1.3
1.4
2.8
0.9
1.9
1.1
0.8
1.1
0.9
0.6
0.8
1.6
1.6
1.6
1.5
1.5
0.4
ONE HOUR AFTER MAXIMUM FLOOD AT GOLDEN GATE

TWO HOURS AFTER MAXIMUM FLOOD AT GOLDEN GATE



THREE HOURS AFTER MAXIMUM FLOOD AT GOLDEN GATE



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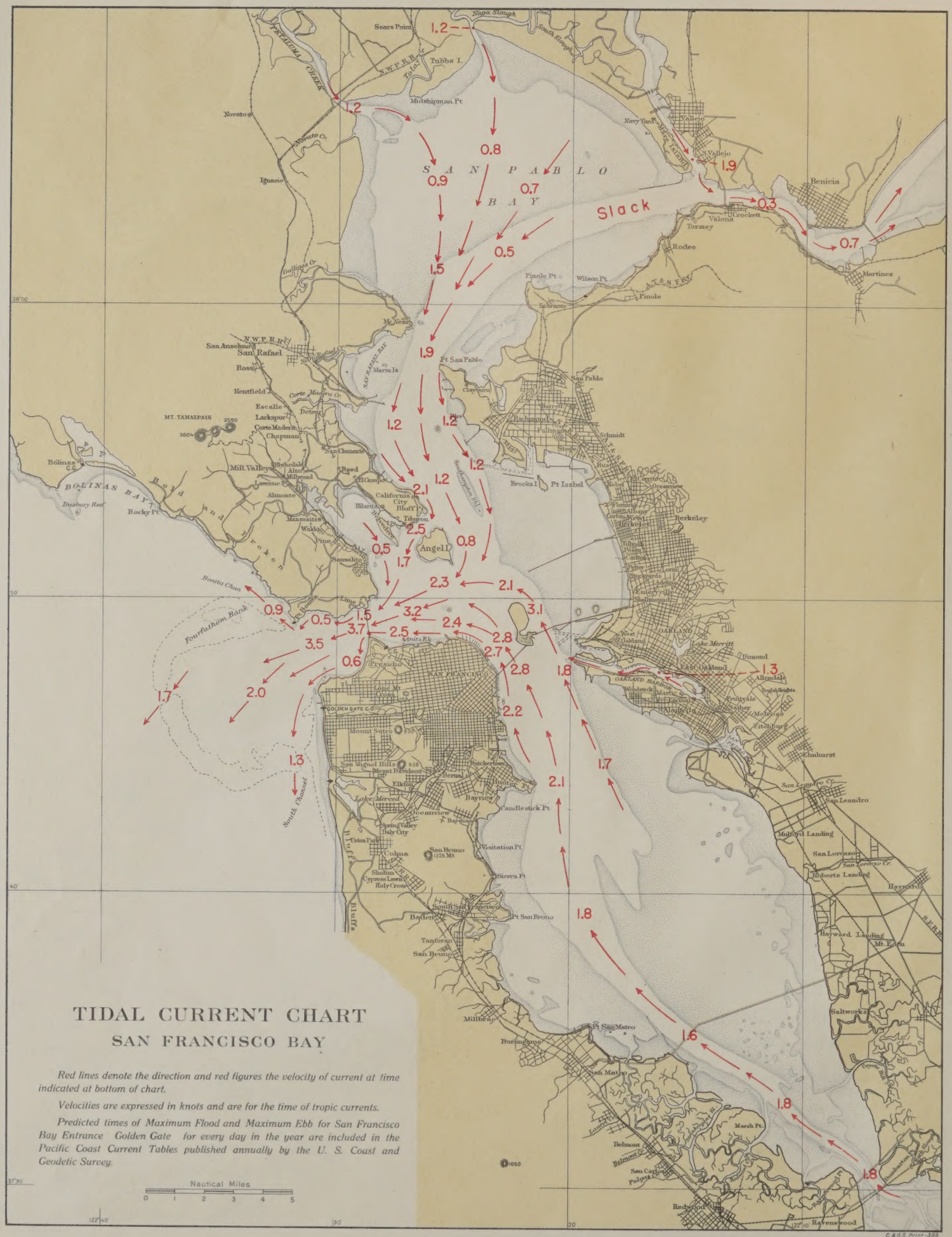
TWO HOURS BEFORE MAXIMUM EBB AT GOLDEN GATE



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ONE HOUR BEFORE MAXIMUM EBB AT GOLDEN GATE


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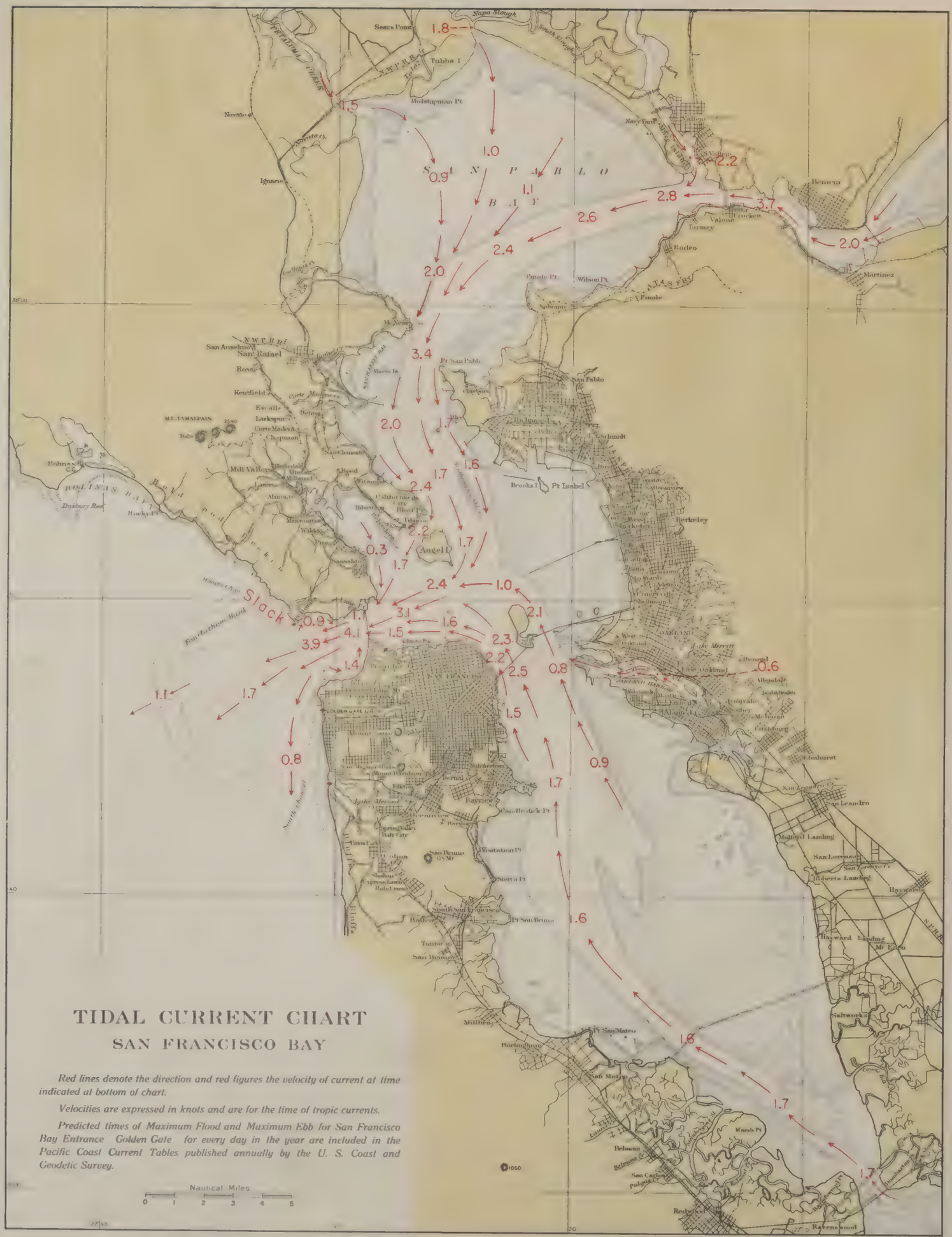
Nautical Miles
Slack
1.9
1.6
1.0
0.9
1.0
2.4
1.6
1.9
1.6
1.7
0.6
2.0
3.1
1.8
1.8
1.7
1.8
2.5
2.7
0.5
1.4
2.0
2.6
1.7
0.7
0.2
1.4
3.7
2.2
3.0
4.5
2.3
2.9
4.3
2.8
3.1
1.5
1.5
2.0
2.1
1.2
1.5
2.2
2.0
1.8
2.0
2.0
MAXIMUM EBB AT GOLDEN GATE



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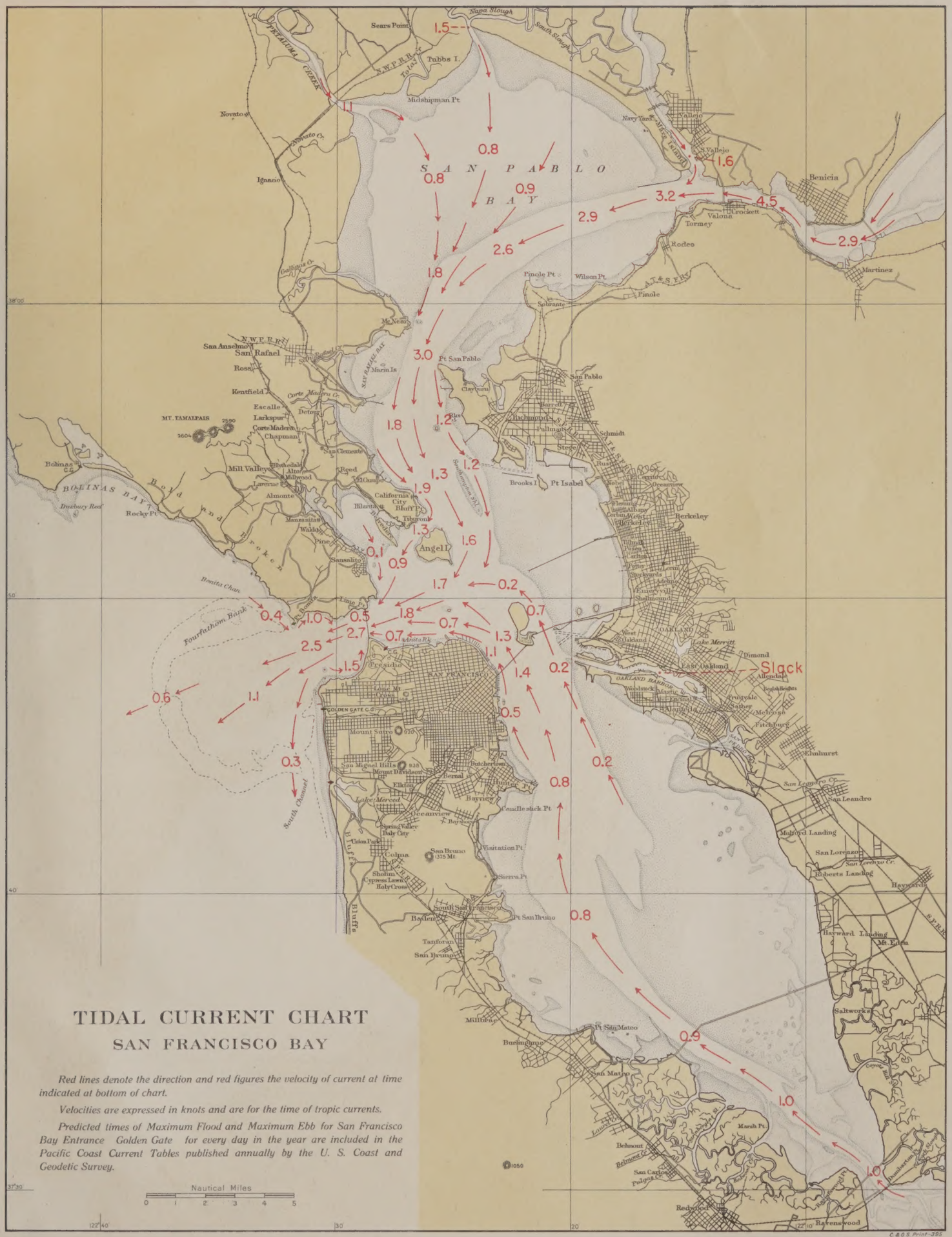

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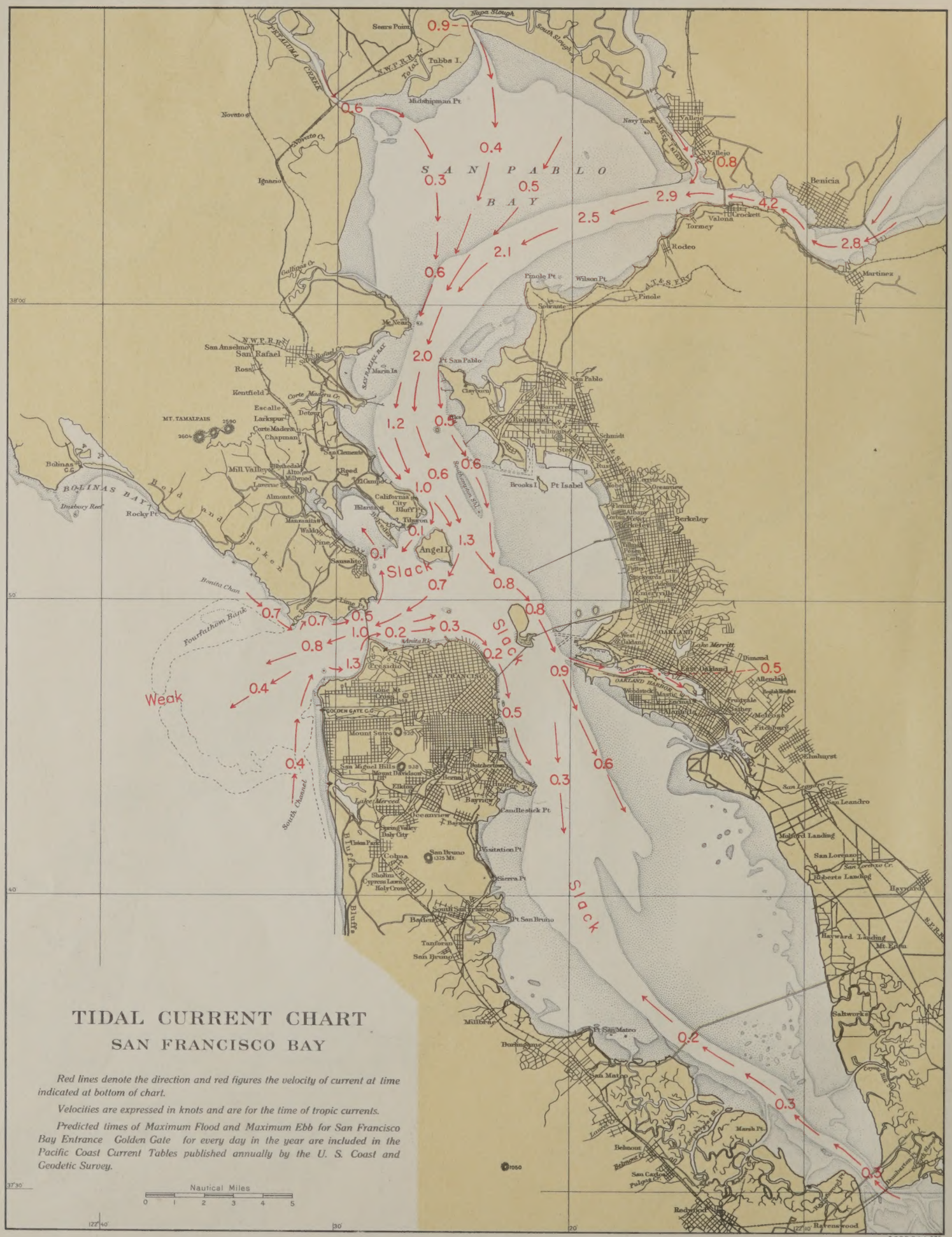

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